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**DE ES FR GB IT SE**(71) Applicant: **JAPAN ABSORBENT TECHNOLOGY INSTITUTE**

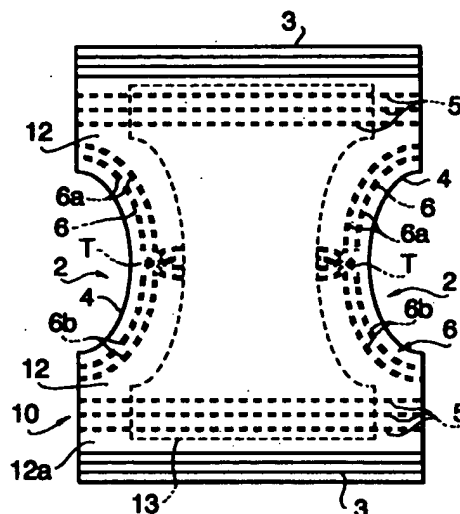
3F., Takizawa Bldg., 26-5,  
Nihonbashi-Hamacho 2-chome  
Chuo-ku, Tokyo (JP)

(72) Inventor: **Suzuki, Migaku**  
4-301, Arusu-Kamakura,  
19-2, Ueki  
Kamakura-shi, Kanagawa (JP)  
Inventor: **Fukui, Hiroaki**  
4-3-6-708, Honcho  
Kawaguchi-shi, Saitama (JP)

(74) Representative: **Klingselsen, Franz, Dipl.-Ing.**  
Patentanwälte,  
Dr. F. Zumstein,  
Dipl.-Ing. F. Klingselsen,  
Bräuhäusstrasse 4  
D-80331 München (DE)

(54) **Absorbent article and method of manufacturing the same.**

(57) An absorbent article having a main body (10) which comprises a backsheet (11) formed of a liquid impermeable sheet, a topsheet (12) formed of a liquid permeable sheet, an absorbent core (13) interposed between the backsheet and the topsheet, and leg gathers (4) disposed along leg holes (2). Two sets of elastic members (6a, 6b) are in a stretched state bonded to a non-woven fabric along the leg holes (2). Each set of elastic members (6a, 6b) is not bonded to the non-woven fabric in a region which traverses a crotch region to extend from one of the leg holes (2) to the other, and is cut in the non-bonding region so that the elastic members (6a, 6b) snap back toward crossing points where the two sets of the elastic members meet to form tails (T).

**FIG. 2****EP 0 626 161 A1**

## FIELD OF THE INVENTION

The present invention relates to a pant-type absorbent article (such as those often referred to as "tapeless-type" or "training pant type") which includes a pair of leg holes for leg insertion, and a waist hole for encircling a waist portion of a body. The present invention further relates to a method for manufacturing such an absorbent article. The absorbent article of this type may be used for infant and adult diapers, feminine sanitary products and the like.

## SUMMARY OF THE INVENTION

Absorbent articles, particularly infant and adult diapers have recently gained increased acceptance from consumers for their advantageous characteristics of stability during use and reduced leakage.

In order for tapeless absorbent articles to fully exhibit their advantageous characteristics, they need to fit snugly to a user's body, particularly at leg hole portions thereof. To this end, such tapeless absorbent articles have elastically stretchable ruffles or leg gathers, as they are generally called, along peripheries of the leg holes.

One example of such tapeless absorbent articles with leg gathers is disclosed in Japanese Kokai Patent Hei 3-195558. Two sets of elastic members are attached along the peripheries of the leg holes to form leg gathers. Each set of elastic members extends along one leg hole from a front end of the leg hole to a midpoint of the leg hole, and continuously extends transversely of a central region (crotch region) of the article to a midpoint of the other leg hole to form a cross-over portion. From the midpoint of the other leg hole, each set of elastic members further extends therealong to a rear end of the other leg hole. Those two sets of elastic members are arranged so as to define a somewhat X-shaped configuration.

Such arrangement of the elastic members advantageously facilitates a continuous manufacturing process of the absorbent articles. Specifically, a liquid impermeable sheet in a continuous web form is continuously transported in one direction. Continuous elastic strands are fed onto the sheet in a sinusoidal configuration for securement thereto. The resultant combination is cut at a predetermined interval to form a composite backsheet incorporating the elastic members secured thereto.

The elastic members arranged along peripheries of the leg holes in the aforementioned, conventional tapeless absorbent article function to form leg gathers therealong. However, the elastic members extending transversely of the crotch region not only are non-functional waste material but cause the absorbent article to deform at the crotch region

when they elastically contract.

An attempt to remedy such disadvantages has been made by adjusting a stretching or contracting rate of the elastic members to be lower at the crotch region than along the leg holes. However, it complicates a manufacturing process, and lowers productivity to intermittently change the stretching rate of the elastic members during the continuous manufacturing process wherein the continuous elastic members are fed along predetermined lines on a web for securement thereto. The elastic members tend to impair flexibility and comfort to a wearer during use at the crotch region of the absorbent article where it is desired to be sufficiently flexible to provide comfort to the wearer during use. Furthermore, added elastic material for the elastic members is required at the cross-over region when they are secured to the backsheet at the lower stretching rate. This results in an increased material use as those elastic members at the cross-over region are not necessary.

The two sets of elastic members secured to the backsheet create bundle-like bunches at the crotch region of the absorbent article, which results in the article having a poor appearance.

It is an object of the present invention to provide an improved absorbent article which is capable of eliminating the above-described disadvantages that conventional articles possess, so that any undesirable deformation of the crotch region due to the contracting force of the elastic members is avoided, and flexibility thereof is insured.

It is another object of the present invention to provide a method for manufacturing such an absorbent article.

In accordance with the present invention, there is provided an absorbent article which is provided with a main body having a waist hole and a pair of leg holes. The main body comprises a liquid impermeable backsheet, a liquid permeable topsheet and an absorbent core interposed between the backsheet and the topsheet. The absorbent article is further provided with a waist gather disposed along the waist hole, and a leg gather disposed along each of the pair of leg holes.

The topsheet may include two layers of sheet materials, and two sets of elastic members interposed between the two sheets of material to form a composite sheet. Each of the two sets of elastic members extend along a periphery of a first leg hole from a front end thereof to a midpoint thereof, and continuously extend transversely to a midpoint of a second leg hole to form a cross-over portion. From the midpoint, each set of elastic members extend to a rear end of the second leg hole, so that the two sets of elastic members are arranged to define an X-shaped configuration. The two sets of the elastic members are secured in a stretched

state to the sheet materials along areas that extend along the peripheries of the leg holes. The crossover portions thereof are not secured to the sheet materials, and are separated so that they snap back toward cross portions of the two sets of the elastic members to define tail portions extending from the cross portions.

As such, the absorbent article in accordance with the present invention has the elastic members extending around leg holes to form leg gathers. The elastic members do not cross the crotch region of the article. Accordingly, the absorbent article provides a snug fit and comfort to the wearer during use, with its leg gathers effectively preventing leakage from the article. The leg elastic members are not secured to the backsheet, so that the absorbent article provides a good appearance.

In one embodiment of the present invention, the topsheet has a through aperture in the crotch region of the absorbent article. The aperture serves as an inlet void of a pocket for communicating urine and fecal material into the pocket defined between the topsheet and the backsheet. This provides comfort to the wearer during use.

The present invention further provides a method for manufacturing a tapeless absorbent article which comprises a main body having a waist hole and a pair of leg holes and comprising a liquid permeable topsheet, a liquid impermeable backsheet and an absorbent core interposed between the topsheet and the backsheet, a waist gather disposed along the waist hole, and a leg gather disposed along each of the leg holes.

Two sets of elastic members in their stretched conditions are positioned, between two sheets of material in elongated web forms, in sinusoidal configurations with an inverted phase relation to each other, so that the two sets of elastic members define a number of elongated oblong areas therebetween. The elastic members are bonded to the sheet material in alternate ones of the oblong areas, and are cut or separated in the oblong areas in which they are not secured so that they snap back toward crossing portions thereof.

The topsheet is combined with the backsheet prior to bi-folding of the resultant combination along a transverse center line. The bi-folded resultant combination is severed along predetermined cutting lines.

The present method can advantageously provide a highly productive process which is capable of securing elastic members to sheet materials without varying the feed rate of the sheet materials.

One embodiment of the present invention will be explained hereinafter with reference to the drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view illustrating one embodiment of an absorbent article in accordance with the present invention;

FIGURE 2 is a plan view of the absorbent article of FIGURE 1 prior to bi-folding and securing the respective side panels thereof;

FIGURE 3 is an explanatory view illustrating an intermediate product during the process of manufacturing a topsheet for use in an absorbent article of the present invention;

FIGURE 4A is a fragmentary cross-sectional view taken along a line A-A of Figure 3;

FIGURE 4B is a cross-sectional view taken along a line B-B of Figure 3;

FIGURE 5 is an explanatory view illustrating an intermediate product with portions of elastic members separated.

FIGURE 6A, 6B, 6C, 6D respectively illustrate plan views of various embodiments of topsheets for use in an absorbent article in accordance with the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 is a perspective view illustrating one embodiment of an absorbent article in accordance with the present invention. Figure 2 is a developed plan view illustrating the absorbent article of Figure 1 prior to bi-folding and sealing the respective side panels thereof to each other.

The absorbent article as illustrated in Figure 1 comprises a main body 10 which has a waist hole 1 and a pair of leg holes 2. The main body 10 includes a waist gather 3 disposed along the periphery of the waist hole 1, and a leg gather 4 disposed along the periphery of each of the leg holes 2. The leg gather 4 is formed by contracting forces of a number of elastic members 6 incorporated therein. A reference numeral 5 illustrates elastic members optionally provided for an improved fit of the main body to a waist portion of a wearer.

The main body 10 comprises a backsheet 11 formed of liquid impermeable material, and a topsheet 12 formed of liquid permeable material, preferably hydrophobic material and an absorbent core 13 interposed therebetween.

In the illustrated embodiment, the elastic members 6 extend inwardly of and along each of right and left, contoured edges of the absorbent article, as shown in Figure 2. One of the important features of the present invention is that the elastic members 6 are positioned between the two sheets of material, such as non-woven fabrics, which form the topsheet. Another important feature is that each set

of elastic members is divided or separated at their longitudinal intermediate portions to form two portions 6A, 6B, and respective ends of the two portions 6A, 6B snap back toward the crossing point where they meet to form tails T.

A method for manufacturing the absorbent article as explained above will be now described.

In Figures 3, 4A and 4B, the two sets of elastic members 6 are positioned between two sheets of material, such as two non-woven sheets of fabric 21, 22, and are arranged in overlapping sinusoidal configurations with an inverted phase relation to each other, so that they define a number of oblong areas therebetween. These elastic members 6 are positioned in a uniformly, properly stretched, state and are bonded to the non-woven fabrics in alternate ones of the oblong areas. A reference numeral 23 illustrates bonding, denoted by shading, where the bonding is provided between the two non-woven fabrics 21, 22, and also between the elastic members 6 and the non-woven fabrics by appropriate bonding means, such as by applying heat and compression, or by the application of adhesives. Reference P indicates bonding regions where the elastic members 6 are bonded to the non-woven fabrics, and reference Q indicates a non-bonding region where the elastic members 6 are not bonded to the non-woven fabrics. The two sets of the elastic members 6 extend along the peripheries of the area that will become leg holes 2 in the bonding regions P, and extend between the adjacent leg holes in the non-bonding regions Q to form cross-over portions.

In the illustrated embodiment, the amplitude of the sinusoidal configuration that each set of the elastic members 6 describes is designed to be greater in the bonding region P than in the non-bonding region Q. This design is intended to decrease length dimensions of the elastic members 6 extending over the non-bonding region Q, so that material cost therefor is reduced, and also length dimensions of the tails T that consequently remain after the division of the elastic members 6 over the region Q are effectively decreased.

The elastic members 6 as partially secured between the non-woven fabrics 21, 22 are cut out along cutting lines X1, X2 in the cross-over portions in the non-bonding region Q, together with the non-woven fabrics 21, 22. The elastic members 6 are not bonded to the non-woven fabrics 21, 22 over the non-bonding regions Q, so that the cutting allows the elastic members 6 in a stretched state to elastically contract due to elastic recovery thereof, and form short tails T, as illustrated in Figure 5.

When region S is cut out along lines L1, L2, a topsheet is obtained which comprises respective halves of the two adjacent, semi-oblong bonding regions P, and the non-bonding region Q located

therebetween.

The cutting of the elastic members simultaneously cuts the non-woven fabrics which enclose the elastic members to form slits therein. Those slits however do not create any adverse results since they are formed in the liquid permeable topsheet.

The elastic members 6 secured to the non-woven fabrics 21, 22 elastically contract due to elastic recovery thereof to form gathers in the region P of the topsheet like conventional articles. The elastic members 6 remain as tails T in the non-bonding region Q (corresponding to the crotch region of the absorbent article) located between the two adjacent bonding regions P. As the tails T are not secured to the non-woven fabrics in the region Q, those non-woven fabrics retain their original flexibility and softness. Accordingly, the topsheet provides an excellent conformity to undulation of a wearer's body.

In the embodiment as illustrated in Figure 3, the amplitude of the sinusoidal configuration that each set of the elastic members 6 describe is selected to be greater in the bonding region P than in the non-bonding region Q. This design permits the quantity and thus the material cost of the elastic members 6 which is not desired in the crotch region to be reduced, and the length dimensions of the tails T that remain after divisions thereof to be decreased.

For the same reason, the stretching rate of the elastic members 6 in the non-bonding regions Q may be increased. For instance, the stretching rate in the non-bonding regions Q is set to about 200% when that in the bonding regions P is selected to be about 100%. Such adjustment of the stretching rate may be made by periodically varying the feed rate of the elastic members.

In another embodiment of the present invention, the cutting of the elastic members 6 simultaneously forms a through aperture in the topsheet.

Figures 6A, 6B, 6C, 6D illustrate topsheets 12 respectively having through apertures 30 of various sizes and shapes which cut out both the elastic members 6 and the non-woven fabrics 21, 22.

In Figure 6A, the cutting is applied in a region located between the two adjacent crossing portions where the two portions 6A, 6B of the elastic members meet to form leg gathers 4, so that the two non-woven fabrics 21, 22 and the elastic members 6 are simultaneously cut out to form an oblong or elongated circular through aperture 30. In Figure 6B, the topsheet is illustrated to have the through aperture 30 which is more elongated longitudinally than the aperture 30 of Figure 6A. The through aperture 30 of Figure 6C is more elongated longitudinally than the aperture 30 of Figure 6B. The through aperture 30 of Figure 6D is longitudinally

offset toward a front or rear end of the topsheet.

The topsheet with the through aperture 30 is then combined with the backsheet to form an absorbent article. When the absorbent article is applied to a wearer, the through aperture 30 is designed to be placed in facing relation to a crotch region of the wearer. Accordingly, the through aperture 30 serves to allow urine and fecal materials to pass into a space defined between the topsheet 12 and the backsheet 11. This helps provide comfort to the wearer during prolonged use.

Although each of the two sheets of material of the topsheet is described above as comprising a non-woven fabric, the one sheet material positioned in facing relation to the backsheet may alternatively comprise a synthetic resin film, or the like when the through aperture 30 is formed, for example as illustrated in Figures 6A through 6D.

After the topsheet and backsheet are combined material inside the bonded oblong regions of sections P are removed to provide cut-outs to form leg holes in the formed garment. Cuts are made along lines L1, L2 to sever the garment in region S from contiguous garments in the production line. The severed garment then is bi-folded about its transverse center line to the configuration shown in Fig. 1 and side seams are sealed at opposite sides of the waist region to form a garment with the defined waist hole and leg holes.

As explained above, in accordance with the absorbent article of the present invention, the elastic members for forming leg gathers are positioned along the leg holes. Only small parts thereof remain as tails in the crotch region where such elastic members are not required. Accordingly, the absorbent article of the present invention can provide excellent flexibility, a snug fit and comfort to the wearer during use, while effectively preventing leakage from the leg gathers. Furthermore, as the elastic members for forming the leg gathers are not bonded directly to the backsheet, the elastic members are not viewed or observed from outside the absorbent article. This helps provide the article with a better appearance, particularly in its crotch region.

When the through aperture is formed in the crotch region of the topsheet, the article can provide comfort to the wearer as the aperture serves as an inlet of pocket for communicating urine and fecal material to the pocket. In accordance with the present method, such absorbent articles can be readily manufactured in continuous processes, with a reduced material cost of the elastic members.

#### Claims

1. An absorbent article comprising:  
a main body (10) having a waist hole (1)

and a pair of leg holes (2), said main body comprising a topsheet (12) for facing toward a wearer's body, a backsheet (11) disposed outwardly of the topsheet, and an absorbent core (13) interposed between the topsheet and the backsheet;

a waist gather (3) disposed along the waist hole (1);

a leg gather (4) disposed along each of the leg holes (2);

said topsheet (12) comprising dual-layered sheet material (21, 22) and two sets of elastic members (6a, 6b) interposed between the dual sheet material,

each of said two sets of elastic members (6a, 6b) extending along a periphery of a first leg hole (2) from a front end thereof to a midpoint thereof, continuously extending therefrom transversely to a midpoint of a second leg hole (1) to form a cross-over portion, and further extending to a rear end of the second leg hole (2) so that the two sets of elastic members (6a, 6b) are arranged to define an X-shaped configuration,

said elastic members (6a, 6b) being bonded in a stretched state to said sheet materials along areas that extend along the leg holes so as to exclude the crossover portion from the bonding, said elastic members being cut at the crossover portion so that they snap back toward cross portions of said elastic members to define tail portions (T) extending from the cross portions.

2. The absorbent article of claim 1, wherein said sheet materials (21, 22) and the elastic members (6a, 6b) are cut out together in the crossover portion, to form an aperture (30) in said topsheet (12).
3. The absorbent article of claim 1 wherein said topsheet (12) comprises a non-woven fabric disposed to face toward the wearer's body, and a synthetic resin film disposed to face toward the backsheet (11).
4. A method of manufacturing an absorbent article which comprises a main body (10) having a waist hole (1) and a pair of leg holes (2) and comprising a liquid-permeable topsheet (12), a liquid-impermeable backsheet (11) and an absorbent core (13) interposed between the topsheet and the backsheet, a waist gather (3) disposed along the waist hole (1), and a leg gather (4) disposed along each of the leg holes, the method comprising the steps of:  
forming a topsheet (12) by positioning, between two sheets of material (21, 22) in elongated

gated web forms, a pair of elastic members (6a, 6b) in overlapping sinusoidal configurations with an inverted phase relation to each other, so that they define a plurality of elongated oblong areas therebetween,

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bonding the elastic members (6a, 6b) to the sheet material (21, 22) in alternate ones of the oblong areas, and

cutting the elastic members (6a, 6b) in the oblong area to which they are not bonded allowing them to snap back toward crossing portions thereof;

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combining said topsheet (12) with the backsheet (11); and

severing the resultant combination along predetermined cutting lines (X1, X2).

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5. The method of claim 4, wherein

said sinusoidal configurations have alternate high and low amplitudes per half cycle, and the elastic members are bonded to the sheet materials in portions having the high amplitude.

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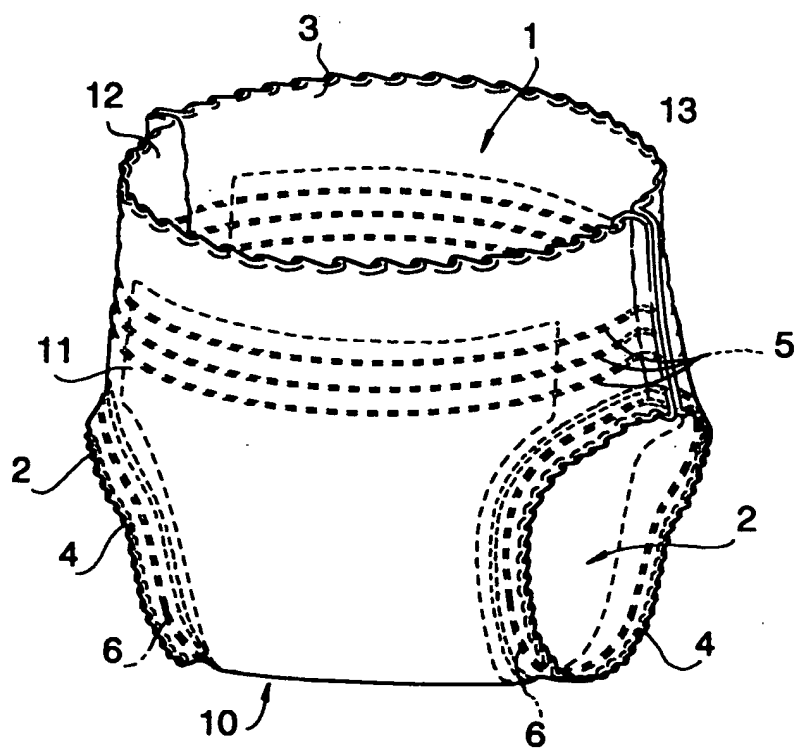


FIG. 1

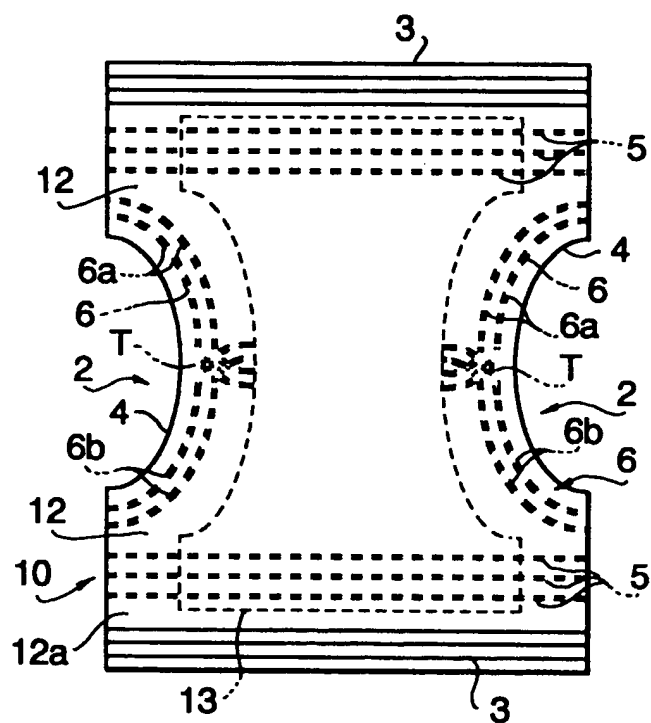


FIG. 2

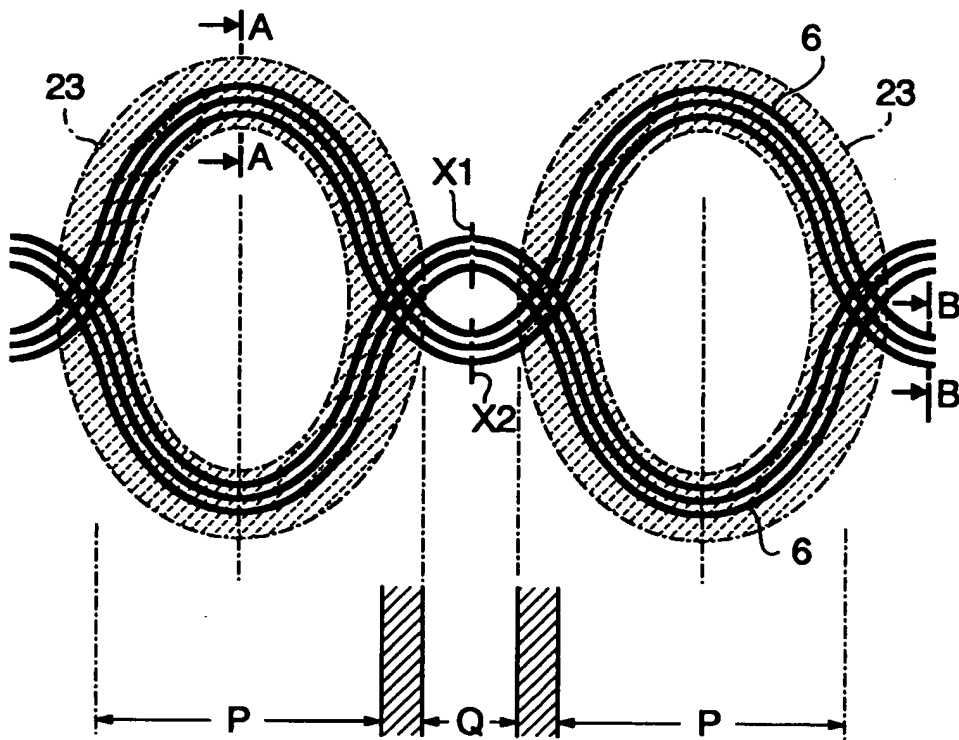


FIG. 3

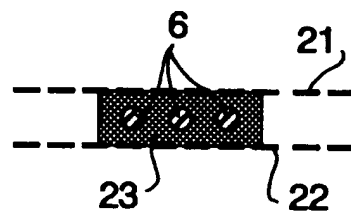


FIG. 4A

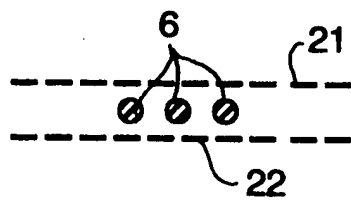


FIG. 4B



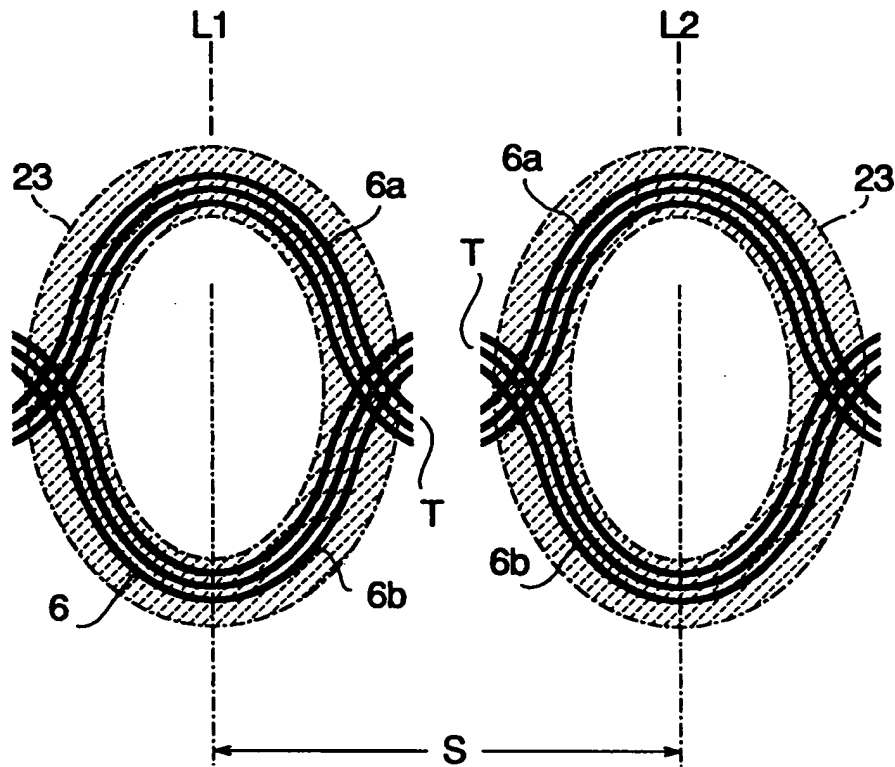


FIG. 5

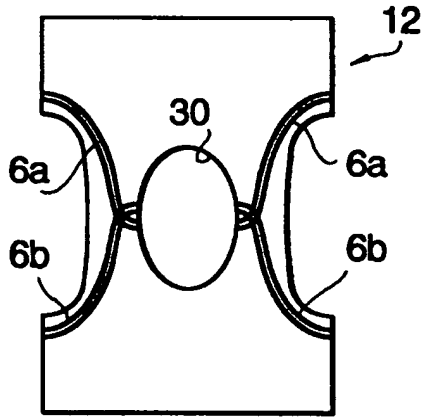


FIG. 6A

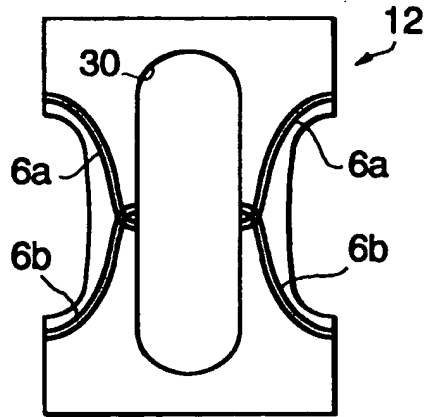


FIG. 6C

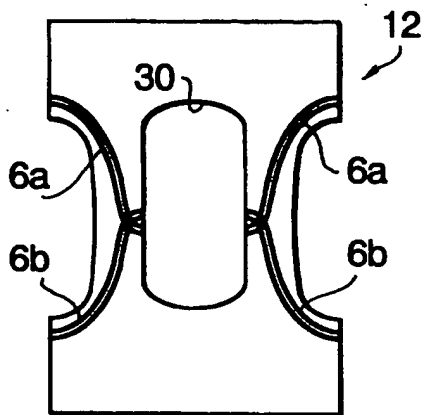


FIG. 6B

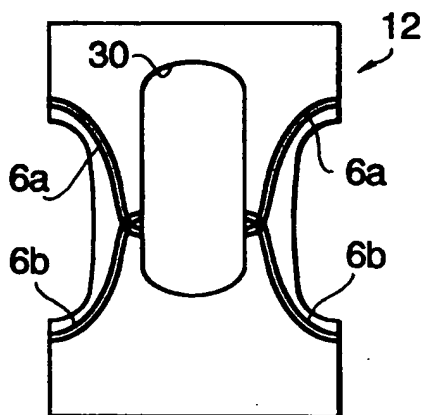


FIG. 6D



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## EUROPEAN SEARCH REPORT

Application Number  
EP 94 10 8162

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 5)
A	EP-A-0 510 715 (UNI-CHARM) * abstract; figures 2,4-5 *	1-5	A61F13/15
A	EP-A-0 437 771 (UNI-CHARM) * column 5, line 39 - line 41; figure 2 *	1-5	
A	US-A-4 662 877 (F.C.WILLIAMS) * abstract *	2	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 5)
			A61F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 August 1994	Examiner Nice, P
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone V : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			